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Developing The Vision: Preparing Teachers To Deliver A Digital World-Class Education System

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Abstract: In 2008 Australians were promised a 'Digital Education Revolution' by the government to dramatically change classroom education and build a 'world-class education system'. Eight billion dollars have been spent providing computer equipment for upper secondary classrooms, yet there is little evidence that a revolution has occurred in Australian schools. Transformation of an education system takes more than a simplistic hardware solution. Revolutions need leaders and leaders need vision. In this paper, I argue that we must first develop educational leaders by inspiring future teachers with a vision and by designing our teacher-education courses as technology-rich learning-spaces. A multi-layered scenario is developed as the inspiration for a vision of a future-orientated teacher-education system that prepares teachers to deliver a 'world-class digital education' for every Australian child. Although written for the Australian context this paper has broad relevance internationally for teacher education.

Introduction

"To teach our children in the way we were taught, prepares them for the past not the future." (Chinese Proverb)

In 2008, Julia Gillard the current Prime Minister, who was the Federal Minister for Education in Australia, wrote to all Australian secondary school principals inviting their participation in the Rudd Government's \$8 billion Digital Education Revolution. The government claimed that:

The Digital Education Revolution will dramatically change classroom education by ensuring that all students in years 9 to 12 have access to information and communication technology. The Rudd Government believes that every Australian child deserves a world-class education.

To be able to compete globally, Australia needs a world-class education system. (Gillard, 2008)

These were noble claims and they have resulted in most schools having access to the computing hardware in upper secondary classrooms (Ainley, Eveleigh, Freeman & O'Malley, 2010). The data indicates that in Australia there is now good provision of computer hardware in schools and high percentages of Australian students have access to ICT resources at home (Ainley, et al, 2010; OECD, 2011). Yet four years after the beginning of the 'Digital Education Revolution', when looking at teaching, in many classrooms not much has changed. Many schools are still far from achieving a world-class education system and dramatically changing classroom education through the integration of digital technologies. Although provided with computer hardware many teachers do not have a vision of a future world-class education system and are still teaching in exactly the same way they did before. There is the expectation that when teachers are provided with computer equipment, they will replace the

old ways of teaching with new approaches. In order to be effective the digital technologies need to be fully integrated in all curriculum areas and students need to become confident users of 21st Century skills (Lane, 2008;OCED,2011).

The Computers in Education Study (CompEd) is an international longitudinal study with twenty-one participating countries. The CompEd Study investigated the introduction and use of computers in schools with data collection in two phases 1989 and 1992 (Pelgrum & Plomp,1993). This study reported that in the earlier provision of computers in classroom in the late 1980`s and early 1990`s there was very little change in pedagogy when the new equipment was provided in schools. In contrast it become another add-on to the existing curriculum. A significant finding of the CompEd study was that staff development and training was one of the factors most strongly associated with the successful implementation of computers in schools (Pelgrum & Plomp,1993).

Scenario Use for Future Planning

In this paper a scenario is developed for future planning in tertiary teacher-education. This visionary scenario can be used to guide thinking as we prepare teachers to lead schools into the future. In many areas of business, experts in the field use the available past and current data about international and global developments to make reasonable predictions of the state of the market in the future (Mc Shane & Travaglione, 2005). Developing a scenario enables more informed forward planning, risk analysis, budget planning, and resourcing for future development projects. Educational institutions can benefit by using these strategies to do forward-planning to accommodate the future needs of the market.

The scenario developed in this paper was considered from a number of different perspectives. The predicted scenario was analysed to see where tertiary teacher education would be positioned in a free market. Aspects of governance, funding, globalisation and the role of technology are discussed. An analysis is used to reveal the strengths, weaknesses, opportunities and threats in the system (SWOT analysis). The information from the “SWOT” analysis provides guidance for the development of safeguards if the predicted scenario comes to fruition.

The Scenario Building Process

Data was selected using an environmental scanning strategy (Ritchey, 2006). This predictive strategy utilises multiple sources of data from Australian and international sources. The data was tabulated and then cross-analysed using a field matrix, as seen in Table 2. The field matrix was used to generate morphological analysis. Morphological analysis was developed by a Swiss astrophysicist, Zwicky, cited by Richey (2006), to structure and investigate a complex set of relationships which can be difficult to quantify (Richey, 2006). Zwicky developed a layered matrix known as a “Zwicky box” in which parameters are plotted across fields to consider contradictions, inconsistencies. Unworkable variables in the data were eliminated (Inayatullah, 2006). Cross-consistency analysis was then undertaken using the data. The scenario was related as a whole to a set of the parameters. This methodology of morphological analysis has been used in large international studies for example, the United Nations University Millennium Project for futures research (Ritchey, 2005).

A further technique Causal Layered Analysis (CLA) was used to broaden perspectives in the development of the scenario. According to Inayatullah (2006). CLA can be used to develop transformative spaces for the creation of alternative futures.

Causal Layered Analysis consists of four levels: the litany, social causes, discourse/worldview and myth/metaphor. The challenge is to conduct research that moves up and down these layers of analysis and thus includes of different ways of knowing (Inayatullah, 2006,p.3).

Causal Layered Analysis (CLA) has been used by organizations such as UNESCO at the World Future Studies Conference in Thailand in 1993 and Southern Cross University Australia in 1994 (Inayatullah, 2006). CLA incorporates the importance of the social and cultural perspectives in framing the interpretation of the information. CLA uses four interconnected layers of discourse to shape the scenario. The first layer, litany, explores quantitative trends and problems to create a current picture. The second layer considers social causes related to the situation and analyses economic, political and historical factors. In the third layer the structure and discourse surrounding the situation are considered. It is in this layer that deeper social influences and cultural structures are integrated into scenario. The fourth layer, goes beyond the surface analysis to work on a deeper level exploring metaphors and symbols to create the vision and the underlying philosophy of the envisaged future system; In this layer it is possible to go beyond the conventional, engaging in creative visionary notions.

The Use of Scenarios in Large Global Projects

Scenarios have been widely used as predictive strategies. They were used by the Organization for Economic Co-Operation and Development (OECD) in the 1996 Ministers conference in Paris a number of scenarios for schooling over the next two decades were developed. The scenario approach was also used at OECD Conferences in The Netherlands in 1998, France in 1999 and Rotterdam in 2000, as well as the “L’ecole Horizon 2020” *The school in 2020* Conference in Paris (OECD, 2001). Guidelines for creating scenario can be obtained from the work of organizational strategists who have worked with multi-national companies such as Shell International, The South African and the Canadian Governments (Kahane, 2001; Senge, 2001; Van Der Heijden, 1996).

A “swot’ analysis was conducted for each layer in the construction of the scenario to consider the strengths, weaknesses, opportunities and threats imbedded in the scenario and recommendations are made about necessary safeguards. In the following section the current context shaping the tertiary education market in Australia will be described. This context has implications for future planning in the provision of education for teachers.

The Bologna Process

Initially a search of the literature was undertaken to examine international models of tertiary education delivery relevant to teacher education courses, particularly the Bologna Process (DEST, 2006; EUA, 2005; IRU-Australia, 2006). The Bologna Process is an initiative by Tertiary Education bodies in the European Union to plan a more unified tertiary sector. Melbourne University and more recently The University of Western Australia have used this model as a basis for re-conceptualizing course structures. The planning model underpinning the Bologna Process has also been used by Edith Cowan University in the preparation of a new model of undergraduate course delivery entitled “Curriculum 2012 and Beyond” that promotes flexible learning and is employability focussed (De Jong, Cullity, & Ashton, 2011). The Bologna Process supports the development of broad undergraduate courses of study leading to more specialised career-specific post- graduate courses exiting with a Master’s level qualification.

Future Funding Models

The literature on school reform and governance, particularly the work on vouchers, school choice and funding has provided evidence of models that have been used in the construction of the scenario (Caldwell & Roskam, 2002; Clausen, 2006; Etscheidt, 2005). Furthermore, current media, ABS statistics, journal articles and government reports inform the author on issues relating to globalisation, funding and teacher education (Barnett, 2009; Commonwealth-Australia, 2007; Fitz, 2002; Goldstein, 2004; Hartocollis, 2005; Joseph, 2006; Kuh, 2000; OECD, 2001).

The current global economic situation and fiscal tightening worldwide does not indicate the provision of increased funding to train teachers, however future funding levels are very difficult to predict. For the purposes of this future scenario we will see how we can achieve better outcomes in our teacher education courses within the current per capita funding allocation. There will be adjustments for the annual consumer price index over the future projection. In this paper the focus will be on rethinking the strategies, processes and procedures of course delivery in teacher education within the current budget structures. As stated in the Top of the Class Report (Commonwealth-Australia, 2007), a comprehensive report on the state of education in Australia, the higher education market will become more competitive in the future. We will have to think of strategies to ensure that we attract the brightest and the best students to teacher education (Barnett, Parry & Coate, 2001; Darling-Hammond, 2000; Hattie, 2003).

Tertiary institutions will need to expand boundaries; the students of the future may not live close to campuses or in the same time zone. We need to allocate more funds to develop high quality instructional materials, leaving less funding for the provision of the physical infrastructure of bricks and mortar and campus buildings the infrastructure costs that currently consume large portions of our budgets. Educational leaders must think about alternative ways to fund and grow services while keeping pace with local and global demands (Lane, 2008; Senge, 2001). To make changes in tertiary level courses requires forward thinking as these changes are expensive and have far-reaching implications, hence the need to use scenarios as a future-planning tool.

Setting the Context: Tertiary Teacher Education

Tertiary education is currently a highly regulated area in Australia, there is growing pressure to deregulate and move towards a free market system, this is referred to in the literature as marketization (Levin & Belfield, 2003). Australian tertiary education has become a priority area for the expansion of private and international tertiary providers. There are currently a number of international private education providers wanting to establish facilities in Australia because of the potential advantages of positioning courses in Australia. For example, Australia is seen as geographically well positioned for offshore campuses for American and European universities wanting to serve the Asia-Pacific market. Other advantages are that instruction is in English and the infrastructure and technology access in Australia are good.

The economic factors in Australia have prompted major policy initiatives on tertiary education in the global political area. The National Competition Policy, states that government businesses are subject to market forces and competition (COAG, 1995), this means that markets are no longer localised and protected. The Multilateral Agreement on Investment and the General Agreement on Trade in Services (GATS) are changing the way higher education will operate on a global level (Education-International, 2006; EUA, 2005). If the GATS agreement gets fully endorsed, subsidies for Australian institutions and students

will become increasingly difficult if not impossible unless those subsidies are made available to foreign businesses operating in Australia. At the World Trade Organization (WTO) meeting in Hong Kong in 2005 industrialised countries put pressure on other nations to open the higher education sector to international competition and liberalise the market (Education-International, 2006; World Trade Organisation, 2000). These increasing global economic market pressures mean that only the strongest and most viable tertiary education providers will survive. The Bologna agreement will now be discussed from the perspective of its potential impact on future planning for Australian Universities in the teacher education sector.

The Future Impact of the Bologna Agreement

The development of the Bologna Process, which commenced in 1999, would seem to have much relevance for the future of Tertiary Education in Australian and the Asia –Pacific Region (De Jong, et.al,2011;DEST, 2006; EUA, 2005; IRU-Australia, 2006). The outcome of the seven-year Bologna Process is that universities in countries in the European Union will have common courses and a common certification and quality framework. As a consequence there will be equality and compatibility between the different tertiary institutions in the European Union.

In 2006 the Australian Federal Minister of Education hosted a conference in Australia with the leaders of the tertiary education sector from the Asia-Pacific Region (DEST, 2006) with a view to using the Bologna agreement as a blueprint for the creation of a common path for tertiary education in Australia and the Asia-Pacific Countries (Armitage, 2006). There has been criticism of the “Bologna-isation” of Australian Universities; the main fear is that universities would lose their identity and autonomy (IRU-Australia, 2006). However, the danger is that if Australia does not align with the changes proposed in Europe, courses offered here will not be accredited and therefore not attractive to foreign students and local students who are planning to work for international companies (De Jong & Cullity,2010). Furthermore, China has been granted observer status at the Bologna Process planning meetings, which indicates their keen interest in these developments and could have implications for Australian Universities.

Tertiary Teacher Education in Australia

As mentioned in the introduction there are serious problems in tertiary teacher education in Australia. The university where I work is the largest tertiary teacher education provider in the state and one of the largest in Australia. We have experienced a drop in enrolments in our courses over the past nine years. This led to a significant drop in government funding and widespread retrenchment of experienced staff in the school of education. It also led to increased workloads, larger class sizes and the lowering of admission scores for students. The cutbacks in funding have also led to the reduction of the use of innovative teaching strategies for example integrating the use of new technologies (ICT) in teacher education courses (Lane, 2009). Teacher educators are under pressure to deliver high quality graduates who have the skills to drive a digital education revolution as proposed by the government yet currently we do not have the additional funding or resources to deliver this high level of technology rich education.

The government is spending billions of dollars to put computers into school classrooms, yet it is the teachers who need to be trained in this resource-rich environment. To deliver a ‘Digital Education Revolution’ we need to start by investing in our future teachers

and their education. By resourcing teacher education the government will be investing in the future and building a firm foundation for a ‘world-class education system’.

Future Funding Allocation for Teacher Education

The demographic data indicates an ageing Australian workforce in 2030, with the percentage of the population not economically active increased to approximately 35-42% (A.B.S., 2010). This indicates the need for a reduction in funds for government projects, and a potential change in how tax funding will be spent. The large number of voters who are over 65 could strongly influence how tax funding will be spent. The priorities for government spending could become health care and pensions, which could necessitate cost cuts in the tertiary education sector.

One method to reduce government spending on tertiary education would be to promote a more stratified tertiary system. The stratified system would be more cost effective by concentrating research activities, which are costly, in only a few Universities and downgrading the status of other universities to teaching-only institutions. Arguably, this model was foreshadowed by the Howard government’s introduction of the research quality framework (RQF) system in 2007 although this has been disbanded by the current Labor government, we are still not sure of the implications of the new system. At present an active research program is a key defining characteristic for being a university (Attorney-General, 2006), so this stratification could result in many of the universities specialising in teacher education being downgraded to lower status institution namely, teacher training colleges. Although this model indicates fiscal savings for the government in the short term, it could lead to a long-term decline in the quality of the tertiary teacher education sector. Teaching only institutions would not attract international students. Furthermore, the lack of funding for research would deter many academics and lead them to seek work overseas or in other sectors.

Another option would be to move towards a more marketised model. Universities have already raised fees paid by students by 25% over the period 2005-2006. If these funding policies were to continue over the next twenty years a much more privatised tertiary sector would emerge. This approach is advocated in the work of Friedman (1993) and in publications by the Australian Liberal politicians (Nelson, 2003). In Table 1, it can be seen how student contributions to the cost of their education has increased on an annual basis under the previous Liberal government. Students now pay 27.6% of the real costs of their tertiary education while under former Labor government; free tertiary education was used as a way to build the nation. The provision of free tertiary education to teachers as was done in the past with a bond system would help to attract high quality students to teacher education. The bond system has been used in many countries to attract and retain teachers. Pre-service teachers education is paid for by the government in advance, once they qualify the teachers repay the bond by working in government schools, often in hard to staff areas for a set number of years. If they break the contract they repay the bond to the government. Table 1 shows the increasing student contributions towards the cost of their tertiary education. The current discussions about the uncapping of University fees could lead to students being charged higher fees in the future for courses that are expensive to run like teacher education.

Year	Total commonwealth funding for operating purposes	Total actual student contributions	Average student contribution towards the cost of education
2001	\$5.3billion	\$1.4billion	26.1%
2005	\$6.4 billion	\$1.7billion	26.8%
2008	\$7.7billion	\$2.1billion	27.6%

Table 1: Projected average student contributions as a percentage of total commonwealth funding for higher education institutions in Australia

(Data from The Higher Education Support Act 2003 (Attorney-General, 2006))

A series of tables will now be presented which summarise each layer of the data in the Causal Layer Analysis process. Table 2 summarises layer one of the data. The table was developed from a review of the literature and policy documents to indicate quantitative trends and problems in the higher education sector impacting on teacher education. This part of the causal layer data analysis process contributes to the development of a scenario. Table 2 highlights some of the potential impacts of government policy on tertiary education in Australia.

Funding	Consumer behaviour	Impact on education	Market Paradigm	Features- Scenario 2030	Weaknesses in a stratified tertiary education system
*Aging population demographic (ABS, 2010) **Smaller % economically active *Lower output per capita *Spend money on pensions	Quotas and TER scores for courses- *Few full fee-paying places. *Economy strong, many jobs available,	*25% increase in fees *User pays system. HECS/ FEE HELP *Fall in demand for tertiary education reduced funding- new technology	*Health care privately funded sector. *Schooling more private provision *Poorly resourced *University degrees are expensive	* stratified higher Ed system * Universities vs Training colleges (cheaper to fund.) * Based inflexible-quota system-	*Not compatible with Europe/ Asia? *Expensive to fund *Lose top academics to research orientated universities * Poor staff profile *Fails to attract international students and high achieving local students *Loss of top academics in teaching institutions leads to decline in quality of teaching not research based

Table 2: Causal Layer Analysis 1st layer litany- quantitative trends & problems

In the funding column it can be seen how the ageing population will influence the tax base and the distribution of government funds. The reduction in funding to the tertiary sector could impact on teacher education by leading to the development of a stratified education system. A stratified system would have many potential weaknesses for teacher education as outlined in table 2. Ultimately it would not stimulate growth and provide the high cost digital technologies and 21st century pedagogy needed in tertiary teacher education sector to prepare teachers to work in a “world class” education system. This stratification of the tertiary system would downgrade the status of teachers, as teacher education faculties could be turned into training colleges for non-degree status programs, which are cheaper to fund.

An Overview of the Socio-Political Influences

Table 3 contains data, which presents an overview of the economic, political and historical factors influencing the tertiary teacher- education through summarising the data in the 2nd layer of CLA. Current literature on education, economics and globalisation heralds the twenty first century as an era of rapid change and innovation (Goldstein, 2004; Hargreaves, 2003; Mc Shane & Travaglione, 2005). According to systems theory and globalisation there are many layers of interactions and interconnections between countries and economic systems. These shifts and changes in one level of the system will have ripples and repercussions around the globe. It is an era of global co-operation and agreements, but paradoxically in many sectors there is fierce competition for market share and survival (Hargreaves, 2003; Goldstein, 2004).

Funding	Consumer behaviour	Impact on education	Market Paradigm	Features- Scenario- 2030	Weaknesses
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<ul style="list-style-type: none"> * Globalism *International market pressures. *Bologna *free market system * Economic rationalists- Thatcherism/ Reganism *Student as a client buying a degree, 	<ul style="list-style-type: none"> * want more choice. *International market-competition- *Strong Australian Dollar-increased costs *Competition from Europe *Poor consumers- 	<ul style="list-style-type: none"> *International student-market. *Challenges by tertiary providers in Europe * Australia-moves to free market-user pays system *Growth of Private Universities. 	<ul style="list-style-type: none"> * Market globally *Be more competitive-Quality, price, courses *Bologna accreditation* More choice private Universities for profit /not for profit 	<ul style="list-style-type: none"> *More use of technology- *Competitive quality assurance- *Economically Competitive- *Internationally attractive-Access- Asia-Pacific market *Move to a fully privatised user pays model *Rich can buy a degree of their choice 	<ul style="list-style-type: none"> *Local market suffers *Social equity issues lead to stratified society *Are all courses culturally transferable *Language issues- costs of translations * 2nd language teaching lower standards *Strength of the dollar Global recession? *Quality assurance-academic integrity
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Table 3: A summary of Causal Layer Analysis data, 2nd layer socio- political factors

As indicated above, the strengthening of the European Union and the rising power and rapid growth of China and India are economic realities that are bound to influence growth in the Asia Pacific Region. The growth of liberalism across the Western world has initiated changes in ideology, governance and funding models (Barnett, 2009; Ryan, Parker, & Brown, 2003). For example, local markets are no longer protected and there is global economic market pressure, with only the strongest and most viable surviving.

Australia has a federal system of government, with layers of governance and control at both state and commonwealth levels. Under the previous government the Liberal Coalition controlled the Commonwealth Government for ten years, while the Labor Party controlled the State Governments. This led to conflicts of power and problems in governance yet had a moderating influence on individual party policies dominating any sector. The pendulum has now swung with the Labor party winning in the 2007 federal election. However despite the change in governance few changes have been enacted in the funding of the tertiary sector. The sector is awaiting the impact of the proposed phasing in of the provision of uncapped of funding for university places from 2012.

Currently market pressures are dominating change in the higher education sector. This has resulted in both Labor and Liberal parties having similar policies. Globally, liberal democracies in recent times have made a shift to the right, with conservative ideologies dominating policy (Ryan, Parker, & Brown, 2003). There are moves by both sides towards liberalising markets and allowing free trade policies. For example, the Labor party recently reversed its position of cutting funding for private education; thus both parties are supporting the growth of private schools. It would be reasonable to assume that both parties will also encourage the development of more private tertiary education providers. Private Universities have been operating in Australia for the past twenty years. A recent development was the extension of low interest paying loans to students at private universities.

Safeguards

If a fully marketised model were to emerge by 2030, there would need to be safeguards. A fully marketised model would require that national and local barriers to participation by private providers be removed, allowing a “level playing field” for all tertiary education providers both Australian and International. This could lead to the demise of non-competitive providers and to the establishment of monopolies, such as in the area of childcare, with a private company listed on the stock exchange, but this could have dubious outcomes for the sector (Australian-Government, 2006; Brough, 2006; Clausen, 2006). Since private companies are answerable to their shareholders, and their priority is to make fiscal profit, this could lead to a diminishment of quality and academic integrity. There are also social factors to consider. Not all tertiary education courses are profit making, and a non-marketised model allows the use of cross subsidies for unprofitable courses that are for the common and social benefit. A marketised model could privilege certain sectors of the population, leading to the development of a more stratified society and the growth of an untrained underclass.

The Value of Public-Private Partnerships

In the model of private-public partnerships, government works jointly with private providers. This is in line with ideology of Liberal Democrats in the UK the “3rd Way” of public-private partnerships as seen in new health care models in the United Kingdom (Fitz, 2002), and the charter school movement in the USA. Charter schools are schools that are funded by the state yet run by private companies to operate more efficiently (Goldstein, 2001). Caldwell and Roskam (2002) describe advantages of such a system in which academics focus on teaching and research, and administrative functions are outsourced to private providers. In education this could take the form of partnerships with schools, which could be used for workplace learning and practical teaching.

A possible funding model for tertiary education is the voucher system. The cost of tertiary education would be calculated per capita and this would go directly to the student in the form of a voucher (Caldwell & Roskam, 2002). The market forces would determine the size of courses and institutions. The ideal would be that undergraduate education would be fully funded by government. From a Liberal Party perspective a well-trained labour force would lead to economic growth. From a Labor Party perspective the government funded voucher would have social equity benefits and be for the common good of all. This system could be supported by low-interest loans to students for postgraduate study. As part of this model, more online courses would be offered to attract those working full time or with family obligations. Table 4 shows the 3rd layer in the causal layer analysis, which considers the structure and discourse of tertiary education and introduces a semi-marketised model of private-public partnerships.

In Table 4 a scenario is presented where universities are working with business to provide a market responsive model for delivering teacher education. In this way economic models and the high levels of technology used in the business sector, to promote efficiency and economies of scale, are introduced into the education sector, making education provision more economically viable and thus sustainable. The wide scale use of digital technology and online communication tools can help education providers to broaden their markets and work on an international level instead of a very limited, diminishing local market share. The skills from a business model can be utilised in the education sector allowing the commodification of the intellectual property contained in instructional materials. Education institutions` invest a significant amount of time and money developing instructional materials. These can be

modularised, packaged and presented in interactive online modules, which can be marketed globally.

The provision of vouchers to students to be redeemed at an institution of their choice brings consumer choice into the educational sector. This competition could raise standards making universities more competitive. This could also stimulate the use of technology to deliver courses to international markets.

Funding	Consumer behaviour	Impact on education	Market Paradigm	Features-scenario	Weaknesses
*International trends- USA, UK-3 rd way * PPP-S private public partnerships	*Students select university and course *Increase in international students	Semi-marketised	*Voucher system- *Credits-for basic under grad courses	*Resistance-traditional players- demise of non-competitive providers. *Universities use technology to access new international markets	* Getting ageing electorate to fund tertiary education * Free market principles no cross subsidies for courses needed for social good

Table 4: A summary of Causal Layer Analysis data, 3rd layer- structure and discourse

The summary of data from the 3rd layer of the CLA process shows a future picture of teacher education, which looks quite different to the current model. The main differences would be the incorporation of innovative uses of technology and more flexible, cost-effective modes of teaching. These will be extended and further described in the fourth layer of the causal layer analysis model. This layer uses metaphors and symbols to extend the scenario. The 4th layer of analysis has generated metaphors like seamless, digital, high tech, modular, learning communities and customised delivery.

Preparing Teachers for Working in Technology-Rich Learning Spaces

The rapid growth of technology, particularly wireless digital technology and high speed internet connections, are changing the way we communicate and do business (Pink, 2005). The plans to extend the National Broadband Network (NBR) to remote areas in Australia make it reasonable to assume that by 2030 high-speed Internet access will be the norm for all areas. The expectations and learning and thinking styles of students exposed to these technologies sets expectations on academics to change the way they teach. Lane (2007) reports that data from research in teacher education on the learning needs and styles of future-teachers indicates that students want more flexible delivery of course materials and more use of new digital, mobile technologies in courses.

Funding	Consumer behaviour	Impact on education	Market Paradigm	Features-scenario	Weaknesses
Public /private partnerships – *Scholarships- private schools fund future teachers *Bonds *Community- involvement- innovation- apprenticeship models	*Students flexible options *Digital generation *Workplace learning- online components *Buy the best	*Public Private partnerships *User pays free market *Government funding in the voucher system- *Public-private partnerships	*Free choice *Government credits-vouchers *International credit transfer system to align with Europe-	*Seamless, flexible, digital, high-tech, globalised * New conceptual basis for pedagogy- learning beyond classrooms *Online, paperless	*Traditionalists threatened by change *Costly technological infra structure/ technological support/ staff training

Table 5: A summary of Causal Layer Analysis data- 4th layer generating metaphors

The Predicted Future Scenario

The prediction is that market forces will reshape the tertiary educational sphere. Public-private partnerships will be developed alongside privatised education providers with global accreditation. Governance will be at a global level, with professional organizations providing accreditation to tertiary institutions. Large multi-national publishing houses will provide online educational content linked to accredited course delivery. A system similar to iTunes-U, an online education repository of university accredited materials available to be downloaded on to personal computers and tablet devices by students anywhere, any time (Lane, 2007). In this future scenario there will be a tertiary voucher scheme allowing users to redeem their voucher at an institution of their choice. This marketised model of user choice will transform the tertiary sector, as we know it today.

Digital technology coupled with high speed broadband will allow seamless access to courses from anywhere in the world. Courses will be marketed internationally and tertiary institutions will need to develop specialised niche markets to maintain their market share. Public-private partnerships will provide practical teaching experience and supervision. Students will use digital video technology to video their teaching on their mobile phones or other portable communication devices. Super high-speed broadband with rapid download speeds will be available to all of the Australian population. Students will use cloud-based portals to upload high definition videos of their teaching and analyse and reflect on their practice. The video analysis will be available immediately online for tutors to annotate and give feedback. All texts will be in e-publication formats, available to be read on mobile devices, with embedded video and hyperlinked components to visually illustrate teaching techniques and strategies. Lecturers will use video conferencing to create engaging digital learning communities in real time replacing the need for face-to-face on-campus classes. All teaching sessions will be digitally recorded and stored online for students in different time zones. Teaching will be engaging using blue-tooth interactive audience response devices “clickers” or mobile phones to actively engage with the content and answer questions (De Jong, Lane, Sharp, & Kershaw, 2009). The technology records the student responses and tabulates them using an online poll. The research by Goldstein (2001) advocated the value of students use their performance data to enhance learning by getting immediate feedback and can see how their response relates to the responses of the group. The advances online polling technology and “clickers” allow students to actively engage in learning and have a sense of a virtual community even if they are not physically in the same location.

Courses will be outcomes-based not input-based as in the current model. In the outcomes-based models, students will be credited for teaching experiences and courses completed so that courses of study can be completed in flexible timeframes to suit the levels of experience and previous learning of the student. This will differ from current courses where only inputs, such as the number of years of completed in fulltime study, are accredited. There will be more postgraduate courses at a Master’s Degree level as people move between careers to become more marketable.

Lecturing staff will be flexible in their modes of delivery for example academic staff can run online classes talking to students in real time using voice over internet protocols (VOIP). Resources will be uploaded to cloud storage repositories for easy access anywhere, anytime. Video streaming and enhanced podcasts will be used to virtually connect with students in study centres across Australia and Internationally or in the students’ homes using the Internet or in their workplaces using mobile devices.

Virtual portals and augmented reality simulations for example in Second life can be used for practical teaching practice. In Second Life online simulations of real teaching situations are provided in a safe environment, each student has a virtual character called an avatar that interacts with other virtual characters to practice teaching skills. These online platforms can be used to host online classes and lectures. Using technology the centres for learning can be virtual online spaces. These virtual spaces can be privately owned and form part of the PPP’s (Private-public partnerships). The physical university buildings and

teaching venues will only be needed for very few interactions. This will reduce costs and the need for more physical infrastructure. The essential core campus buildings will be managed by professional companies maximising efficiency, as seen in the Charter School movement in America. This will save money on unproductive use of current teaching space for many hours each year. More courses will be delivered in mixed modes, with a combination of workplace learning, online work and, if needed, intensive blocks of face-to-face tuition (Lane, 2007). The global accreditation system will allow students the flexibility to select courses that suit their learning needs at an institution of their choice (Englund, 2002). Students will not have to complete a qualification at any one institution. There will be more partnerships between institutions, with courses being offered collaboratively between universities so that materials and teaching expertise will be shared.

Weaknesses of this model are that not all content is culturally transferable. In a multicultural society like Australia some cultures could be marginalised, for example indigenous students. In a global context certain values and learning can be culture specific. Care will need to be taken that dominant cultures do not supersede local cultures. Course content will need to be adapted to meet the needs of the learners and the local community.

The Validity of the Prediction

All predictions contain elements of truth and elements of conjecture because there are many variables that can influence society in the future. In this scenario steps have been taken to give a level of validity to the final scenario. National and international data sources were used in constructing the prediction. Expert sources in the area of future predictions were consulted in the construction of the scenario (Boomer, 1992; Carnegie-Mellon, 2006; Commonwealth-Australia, 2007; Department of Treasury and Finance, 2007; Spring, 1998; Thurow, 1997; Young, 1998). Shown below is a “Zwicky box” in which parameters were cross analysed (Inayatullah, 2006).

Scenario	Features of tertiary ed system	Educational Features	Market Paradigm	Quality assurance	Governance
Global	No Uniformity- courses credits Qualifications	Courses not compatible- Not recognised in other areas	Different levels of funding fully funded- private	Varied- levels of quality	Varied/National/ State/ private/ Business/ shareholders/Industry
Current policies in WA	Rigid stratification of tertiary education sector	Input based -Length of course	Strict quota system- User pays- HECS-fee help	Government controlled. AQUA	State and Federal governments layers of control, WACOTT professional association
Bologna process	Unified system for European Countries	Outcomes based	Flexible- transferable credits- still under discussion	Independent Quality control body- accreditation	Individual countries Global accreditation
Asia-pacific Rim	No unified system China- keenly observing Bologna process- Large market for education	Market orientated- value for money- competitive	Full fee paying international students in Australia Currently 32 000	No common system	Individual countries State controlled
International Situation	America/ Canada/Africa- no unified system	Input based	Full fee paying	Will accept Australian Qualifications in some states	Private universities, standardised accreditation-
Predicted scenario in WA 2030	Seamless system Global accreditation	Outcomes based- high tech- digital- online- globally accessible	Full fee paying with government vouchers from country or state of origin Private public	External, independent accreditation agency. Provides certification for courses	A number of layers of governance- global- linked to accreditation quality assurance- national, state- individual consumers- profession-

			partnerships		professional bodies
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Table 5: Morphological Analysis using a Zwicky Box

Conclusion

In this paper a future scenario is presented in response to the challenge faced by tertiary educators to prepare teachers for the ‘Digital education revolution’. The author supports the current governments’ vision of developing a world-class education system, yet proposes that to achieve this we need to look beyond putting computer hardware into classrooms (Lane, 2008). We need to invest in building our future workforce. Both government and academics need to take a serious and transformative look at the key resources to deliver the ‘revolution’, our teachers. If we continue along the current trajectory of reduced enrolments in teacher education courses, inadequate funding to deliver high quality courses for teacher education, and models of delivery that are very similar to those used in the past, we will not be able to resource this vision of a digital education revolution and a world class education system.

There are many challenges facing tertiary teacher education in the future and it is beyond the scope of this paper to address them all. In this paper I have proposed that futuristic techniques can be of value in getting government and educational planners to consider options and be more flexible in their planning and thinking. The rate of change in our current era is rapid. The funding and structure of our current system will not be sustainable or able to deliver the ‘world-class education system’ we will need in the future. We need to think of ways of doing things more effectively and affordably while maintaining the market share. As educators we need to move with the times or risk becoming obsolete (Delfino, Dettori, & Persico, 2010). New technological advances are occurring on a daily basis, yet much of tertiary teacher education is continuing as it did over 100 years ago.

International political changes, like the end of the cold war and the rise of China and India and the current economic global situation have led to changes in ideology held by governments in Western democracies. These are leading to changes in governance and funding models. As potentially influential players and decision makers shaping the future of tertiary teacher education, we need to be mindful of the words of Mintzberg (1996) who proposed a situation of balance. “ Successful democracies have operated on the basis of strong government supported by strong partnerships with business” (Minzberg, 1996).

Finally, some words of caution: we do not want to be in a position where education becomes a commodity to be bought and sold by the highest bidder or the richest student. The future of our children and future society are shaped by the quality of the teachers we train. This is too valuable and strategic to be left entirely to market forces. Education is a way of transmitting our national culture and values. There is no one-size-fits-all solution. We must not allow our academic integrity to be undermined by purely economic pressures. We need to be able to attract and select the best applicants and control the quality of our future teachers. Above all we need to be in a position to deliver the best quality education to our students. A good education is the right of all our students and is necessary in building a strong, successful society.

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